



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electric power machines and technologies [S1Energ2>TiME]

Course

Field of study

Power Engineering

Year/Semester

2/3

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

15

Other

0

Tutorials

15

Projects/seminars

0

Number of credit points

5,00

Coordinators

dr hab. inż. Bartosz Ceran prof. PP
bartosz.ceran@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of mechanics, thermodynamics and fluid mechanics and electrical engineering. Ability to effectively self-education in a field related to the chosen field of study. Is aware of the need to broaden their competence, willingness to work together as a team.

Course objective

The skills and competencies of machinery and power equipment, energy system design and evaluate its performance.

Course-related learning outcomes

Knowledge:

1. Has theoretically founded basic knowledge of primary energy conversion technologies to work, heat and electricity and also has a basic knowledge of mechanical and thermal energy facilities.
2. He knows the basic conditions and technical problems associated with the use of different technologies and sources of energy.

Skills:

1. Able to analyze of operation of the machine, describe the characteristic phenomena in the flow channels, design and installation of the machine to choose.
2. Able to analyze basic and complex energy conversion systems.
3. Able to use theoretical knowledge to balance of energy technology systems.
4. Can describe and compare the basic thermal cycles.

Social competences:

1. Able to work in a group in the performance of laboratory tests and jointly present the effects of the work

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- evaluation of the knowledge and skills listed on the written exam, 50% of total points required

Tutorials:

- credit on the basis of the current check messages and one written tests of the accounting tasks, 50% of total points required

Laboratory classes:

- assessment of knowledge and skills related to the implementation of the tasks your practice, the assessment of report of performed exercise,
- obtaining additional points for the ability to work within a team practice performing the task detailed in the laboratory and developed aesthetic diligence reports.

Programme content

Electricity production technologies using fossil fuels.

Construction and operation of energy equipment in a steam power plant.

Course topics

Lecture:

Primary and processed forms of energy. The structure of energy resources. Engines and working machines, basic types, working rules, ranges of applications. The main technologies of primary energy conversion to work, heat and electricity: internal combustion engines, steam technologies, gas technologies, gas-steam technologies. Comparative and real circuits. Construction of internal combustion engines, boilers, turbines, pumps, heat exchangers. Turbine operation in the action and reaction stage, heat exchange surface in the steam boiler, power demand for supplying the plant's own needs. Promising energy technologies.

Tutorials:

Reading the enthalpy of water vapor from the i-s diagram.

Deriving balance equations based on the scheme of a steam power plant.

Energy analysis of the technological system of a steam power plant.

Laboratory classes:

During the course the following laboratory exercises will be carried out:

- 1.Measurement of centrifugal pumps.
- 2.Radial fans test.
- 3.Determining the operational characteristics of a wind turbine.
4. Determination of the thermal conductivity coefficient of insulating materials using the pipe method.
5. Measuring the temperature of the medium using various methods.
6. Determining the characteristics of an electric water heater.

Teaching methods

Lecture:

Lecture with multimedia presentation supplemented with examples given on the board.

Tutorials:

Tasks counted on the board.

Laboratory classes:

Measurements of device working parameters at the teaching stands.

Bibliography

Basic:

1. M. Pawlik, F. Strzelczyk: Elektrownie, WNT W-wa 2012, 2017
2. T. Chmielniak: Technologie energetyczne, WNT W-wa 2014
3. W.R. Gundlach: Podstawy maszynprzepływowych i ich systemów energetycznych, WNT W -wa 2016

Additional:

1. W. M. Lewandowski - Proekologiczne źródła energii odnawialnej, WNT W-wa 2012
2. J. Marecki: Podstawy przemian energetycznych, WNT W-wa 2014
3. P. Orłowski, W. Dobrzański, E. Szwarc - Kotły parowe. Konstrukcja i obliczenia, WNT W-wa 1979
4. B. Ceran, K. Sroka: Planning the operation of hybrid generation system in the power system in a multi-faceted approach, ACTA ENERGETICA numer 1/30 (2017) s.4-9
5. Cezary Polski, Tomasz Polski, Jacek Roman (WIŚiE), Robert Wróblewski (WIŚiE), Jarosław Bartoszewicz (WIŚiE), Bartosz Ceran (WIŚiE), A novel concept to improve the flexibility of steam power plants using an electric feedwater heater, Applied Thermal Engineering - 2024, vol. 236, Part B, s. 121661-1-121661-15/

Breakdown of average student's workload

	Hours	ECTS
Total workload	132	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	2,50